Natural Heritage & Endangered Species Program

Commonwealth of Massachusetts
Division of Fisheries & Wildlife
Route 135
Westborough, MA 01581
www.nhesp.org
508-389-6360/Fax: 508-389-7891

Massachusetts Natural Communities
Prescribed Burning in Massachusetts

Photo by Joanne Singfield

Many people are surprised to hear about the fundamental role that fire plays in shaping the Massachusetts landscape. For many decades total fire exclusion from all natural lands was general policy throughout Massachusetts and the entire United States, because of difficulty in stopping uncontrolled fires and the terrible damage wrought in the late 1800s by slash fires after timbering. Fire exclusion resulted in the decline of numerous species and degradation of entire ecosystems. But first in the southern US, and then the Midwest, land managers began to realize that some vegetation types require fire, with chemistry and structures that actually promote fire. Habitats that evolved with fire are best maintained with fire. Fire is used to control diseases and insect pests in southern pine plantations. Midwestern prairies and savannas are being restored and maintained with the reintroduction of fire, long considered a natural component of their ecology. Pinelands and grasslands generally have come to be regarded by ecologists as fire adapted natural communities. Massachusetts has several native natural communities that are fire adapted, including some that provide habitat to state- and federally-listed rare, endangered, or threatened species.

Fire as an evolutionary force

Fire prone vegetation and associated animals - the natural community - tend to occur in dry habitats where there are few natural fire breaks to stop fires. These dry conditions result in slow decomposition of plant debris, causing a build up of dry dead material. In Massachusetts the fire prone natural communities also tend to be on nutrient poor soils, in which slow decomposition of leaf litter traps the ecosystem's nutrients in the litter layer. The plants in these natural communities evolved with the prevailing conditions of seasonal aridity, low nutrient levels, and occasional disturbance by fire, wind, frost and salt spray near the coast. Some plants have adapted to withstand fire by having thick insulating bark, being able to re-sprout from the roots or stem, or by having the growing point protected under ground or under layers of plant material. Other plants in these natural communities have seeds that survive burning, are stimulated to germinate by fire, and grow quickly after a fire, when the nutrient rich ash is available and the overstory has thinned, allowing more light to reach the seed. Not only do some plants withstand fire, but some seem to encourage fire. Scrub oak, huckleberry, and pitch pine foliage all

contain volatile oils that are released when heated, and the plant can burst into flame as the heat increases. The amount of time that has passed at a given site since a fire affects the structure of the vegetation, and diversity and distribution of both plant and animal species.

Fire maintained habitats

In an attempt to restore moderately natural conditions to a few fire maintained natural communities, several public and private conservation groups use prescribed burning in Massachusetts. The natural communities of Massachusetts in which most prescribed burning has taken place are grasslands, heath lands, pitch pine/scrub oak barrens, and pine woodlands. In habitat maintenance burns, natural biological diversity is being maintained, exotics removed, and invasive woody plants restricted

Mosaic of vegetation in disturbed areas

Before European settlement the landscape of southeast Massachusetts was comprised of a mosaic of vegetation types caused by different frequencies of fire disturbance across the landscape. Some areas burned regularly from lightning or ignition by Native Americans, other areas burned occasionally, and some, such as islands in lakes, burned very infrequently. These varying burn frequencies, combined with topography, created a large, landscape level mosaic of different aged natural communities. Places that burned regularly were more open, with less understory than occasionally burned areas. In oak dominated areas of southern New England fires were common, with periodic, larger scale fires that burned more intensely, creating more severe disturbance in the forest ecosystem. Low intensity frequent fires favor oak dominated systems with grasses and wildflowers growing in openings. To preserve our biodiversity, we need to restore periodic fire, so that species adapted to all successional stages, all frequencies and intensities of burning, have habitat. Approximately 30% of the MESA-listed plant and animal species in Massachusetts benefit from the conditions created and maintained by fire. These include many moths and butterflies, two reptiles, several bird species, and dozens of plant species.

Habitat protection – pitch pine/scrub oak barrens

These fire-maintained habitats are necessary for the survival of viable populations of some unusual rare or endangered native species. In southeastern Massachusetts there are thousands of acres of pitch pine scrub oak barrens, a fire maintained habitat. The now-extinct Heath hen (*Tympanuchus cupido cupido*) lived in the pitch pine/scrub oak barrens where sparse oak provided cover and they ate acorns and berries. Without fire, the openings got smaller and the scrub thicker, crowding out the hens. When fire did burn through the scrub oak it was intense killing adults and young, which had already been decimated by poaching, disease and predation by feral cats. Now the habitats of many rare plants, as well as moths and butterflies that feed on them, are being reopened and revitalized after years of fire exclusion. Studies have shown that native plant species diversity in the pitch pine/scrub oak of barrens is greater following a fire and greater than in unburned mowed areas. Diversity begins to decrease again as scrub oak becomes more dominant. Because of the need of different species for different conditions, particularly natural communities maintained by disturbances, there is an attempt to establish a mosaic

at each large area being managed, and not have complete disturbance of any one site at a time. This approach provides animals with places to go during fires and sources for recolonization if necessary. Prescribed burns, as with any wildland fire, do not burn uniformly. Within the bounds of a burned area, some spots will have burned intensely, killing plants and burning the organic soil, other parts may be almost untouched, and much of the area only moderately burned.

Habitat protection – Grasslands

Grassland prescribed burns are used frequently in Massachusetts. Performed before or after grassland bird species have nested and before the native species of grass begin to grow, prescribed fire burns the old grass stems, invading shrubs, and woody growth. The area blackened by the fire begins to green up before surrounding areas because the ash absorbs the heat from the sun and warms the ground. In Myles Standish State Forest, Bird's foot violet was one of the first plants to appear, flowering within a week of a fire. This was the larval food plant of an extirpated butterfly in Massachusetts, the Regal Fritillary. Although the above ground portion of woody plants may be killed, many sprout from their roots. The year after a fire, some plants flower vigorously in response to the pulse of nutrients released. Fruiting peaks two to three years after a fire. The abundance of new growth in the years after a fire attracts a variety of animals, both vertebrate and invertebrate, with different species attracted to different stages of plant succession. Several of the rare plants that grow in sandplain grasslands have responded well to fires, with enhanced flowering and seedlings occurring in greater numbers in the burned areas. Seeds survive in the litter layer below the plants, of which only the surface layer is burned in most prescribed burns.

Maintaining grassland and heathland with prescribed burning maintains the habitat of many rare plants and animals. Bushy Rockrose, Nantucket Shadbush, Sandplain Flax, and Sandplain Blue-eyed grass are grassland species that need open conditions. Several butterflies use specific grassland species for larval foods, and the adults rely on other grassland flowers for nectar. Grasshopper sparrows and short-eared owls are among the birds that require the open character of grasslands. Although these different natural communities have evolved to require different fire frequencies and intensities, fire is a part of their natural dynamism. Fire is the preferred method for maintaining the habitat that is necessary for the survival of these populations of grassland animals and plants. Some wetland grasslands also have histories of frequent fire and prescribed burning is used in restoring these habitats as well.

Fire by prescription

The approach to prescribed burning is scientific and not undertaken lightly. The primary concerns for all prescribed burns are personal and site safety. Planning is critical for every burn, whether it is conducted for research purposes, restoration, fuel reduction, or habitat maintenance. The areas to be burned are studied before fire; vegetation and animal surveys are completed for comparison with studies afterwards. Most areas are divided into management units so that an entire habitat type is not burned in any single season. Mowing in conjunction with periodic fire allows managers to meet their goals safely while not impacting fire sensitive species. Management plans are written for the

entire property, with goals for vegetation structure and composition and specific management goals and objectives (maintain the habitat, restore the habitat, change the habitat, for example). A fire prescription is written for each proposed fire, which includes the weather in which the burn will take place (maximum and minimum temperatures, humidity, wind direction, and speed), the fuel moistures needed to achieve the desired intensity of fire (if fuel moistures are high enough, some vegetation won't burn), the equipment necessary, the size of fire crew, who will be "burn boss", and the type and location of fire breaks. Fire behavior and weather are monitored throughout the burn, and if the prescription parameters are exceeded the fire is "shut down". Permits are required from the town fire chief and the air quality staff at DEP's regional offices. The local fire chief can of course stop the fire at any time. There is a public meeting in most areas before prescribed burning is introduced. Abutting landowners are notified of fire dates, reasons, and expectations.

Natural Communities that benefit from prescribed burning:
Sandplain grassland
Sandplain heathland
Scrub oak shrubland
Pitch pine-scrub oak
Ridgetop pitch pine-scrub oak
Calcareous fen
Oak woodland

Originated: November 1990
Revised: June 2006